CLAIMS

We Claim

1.   A method to determine properties of a water-lain sediment body from a measurement of grain size distribution and deposit thickness at one location in the body, comprising:

    (a)   determining the flow properties at the measured location;

    (b)   extrapolating the flow properties back to the inlet through which the depositing flow was emitted;

    (c)   determining at least one property of the water-lain sediment throughout the sediment body by modeling the flow properties using the extrapolated flow properties at the inlet from step (b) as a boundary condition.

2.   The method of claim 1 wherein the properties of a water-lain sediment body are selected from the group comprising thickness of the body, size of the body, shape of the body, grain size distribution of the body, flow velocity above the body, suspended sediment volume fractions above the body, deposition time, flow height above the body, inlet flow conditions and any combination thereof.

3.   The method of claim 1 wherein the flow properties are selected from the group comprising flow velocity, suspended sediment volume fractions, deposition time, flow height and any combination thereof.

4.   The method of claim 1 wherein an iterative process is used to determine the flow properties at the inlet.

5.   The method of claim 4 further comprising using a relationship between inlet flow properties and maximum deposit height to determine when the correct inlet flow properties have been found in the iterative process.

6.   The method of claim 4 wherein relationships between inlet flow properties is used to determine when the extrapolation of the flow properties has reached the inlet.

7.   The method of claim 1 wherein the flow properties at the measurement location are determined based on a relationship of the suspended sediment volume fractions in the flow for each grain size to other flow properties.

8.   The method of claim 1 wherein the extrapolation of flow properties is accomplished by utilizing characteristic curves of equations describing the flow.

9.   The method of claim 1 wherein at least one property of the sedimentary body is predicted using the Froude number at the inlet as an indicator of at least one property of the sedimentary body.

10.   The method of claim 1 wherein at least one property of the sedimentary body is predicted by using a non-dimensional parameter wherein the non-dimensional parameter is a function of the Froude number.

11.   The method of claim 1 wherein a property of the sand body is predicted by modeling, using the flow conditions at the inlet as a boundary condition.

12.   A method to determine properties of a water-lain sediment body throughout the body from a measurement of grain size distribution and deposit thickness at one location in the body, comprising:

    (a)   estimating the flow height at the measured location;

    (b)   determining the flow properties at the measured location from the grain size distribution and deposit thickness at the measured location;

    (c)   extrapolating the flow properties along a characteristic curve intersecting the measurement point;

    (d)   identifying the maximum extrapolated deposit thickness;

(e) identifying the inlet point along the characteristic curve as the point where the flow properties are consistent with the inlet conditions;

(f) repeating steps (a) through (e) until the relationship between the maximum deposit thickness and the flow properties at the inlet is consistent with the flow height and Froude number at the identified inlet point;

(g) predicting at least one property of the water-lain sediment body throughout the body by using the extrapolated flow properties at the inlet point as a boundary condition for a forward model.

13. The method of claim 12 wherein the flow properties are selected from the group comprising flow velocity, suspended sediment volume fractions, deposition time, flow height, and any combination thereof.

14. The method of claim 12 wherein the properties of a water-lain sediment body are selected from the group comprising thickness of the body, size of the body, shape of the body, grain size distribution of the body, flow velocity above the body, suspended sediment volume fractions above the body, deposition time, flow height above the body, inlet flow conditions, and any combination thereof.